

RESPECT 2019: Yes, we still need to talk about diversity in computing

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Computer scientists have ended wars, taken us to the moon and beyond, put super computing on our desks, and changed the way we communicate forever, but few people know the broad and diverse roots of these technological innovations. While many people have learned of Alan Turing's contributions to ending World War II from the recent movie *The Imitation Game*, few know about the thousands of women codebreakers at Bletchley Park, with one woman, Mavis Batey, discovering the Enigma setting that led to a key Allied victory in 1941 [1]. Margaret Hamilton, who coined the term software engineer, helped write the computer programs that controlled the Apollo missions to the moon, and whose work to detect and correct system errors were critical to the success of Apollo II in 1969 [2]. Mark Dean, the first African American IBM fellow and 2001 inductee to the Inventor Hall of Fame, invented the standard bus, the color monitor, and the gigahertz microchip, three of the nine inventions that led to the success of IBM personal computers [3]. Mexicana Laura Gomez, a formerly undocumented immigrant, became a founding member of Twitters international team, and in 2015 founded Atipica, a software startup that builds artificial intelligence to help companies reduce bias in hiring [4].

The lack of qualified U.S. graduates available in computing continues to create challenges for the country, especially in areas such as national security, where U.S. citizenship is often a prerequisite for employment. While this Quiet Crisis was predicted in 2003 [7], the nations approach to addressing it can be best described as more reactive than proactive. The effects of not proactively working toward broader participation in computing have been particularly impactful for students of color, specifically African-American and Latinx, whose representation in the field is still dismal. According to the 2017 Taulbee survey, less than 4% of all bachelors degrees in computing were awarded to African-Americans,

with slightly more than 8% to Latinx graduates [8]. At the graduate level, these percentages are even smaller.

In 2016, African-Americans comprised approximately 12% of the U.S. workforce [7]. By 2026, this percentage is expected to grow to slightly more than 21%, with African-American women comprising a large share of that workforce. Latinx workers comprised approximately 17% of the U.S. workforce in 2016 [8] and are projected to grow to 20% by 2024 [9]. Two demographics that currently comprise almost one-third of the U.S. workforce (and are projected to grow to over 41%) comprise less than 12% of all graduates in our fastest-growing fields. Women comprise 47% of the 2016 workforce, but earned 19.1% of computing degrees in 2017 [6]. To address the increasingly urgent need to have more computing graduates entering the field, we must increase the number of students from these traditionally underrepresented groups.

While there are a number of efforts to increase representation, these numbers highlight an important point: There is still much work to do across not only industry, but also in academia to make computing more diverse, equitable, and inclusive. As our growing population becomes more diverse, and computing technologies are more widely used across all industries, it is increasingly important to broaden access to computing education. Diversity brings access to a larger talent pool, and one that more accurately reflects the needs of society and our workplaces. Diversity in the computing workforce would result in technologies being designed and developed by teams that better understanding of the needs of society - because the teams themselves would be more equitably drawn from our rich, diverse population. In this discussion, we should no longer think of just diversity, but also inclusion and equity. Inclusion means that we not only value including people from diverse groups of all kinds, but we recognize peoples differences and value what they bring to the table. Equity means that we recognize that not everyone has had equal access to computing education, and we strive to correct that imbalance.

Students start making their own academic decisions early, selecting courses that have an impact on preparation for college and careers even before high school [10], [11]. Students who do not consider a computing major or career as a positive option or, at a minimum, have a positive perception of computing subjects may not enroll in the necessary high school courses that would prepare them to enter computing-related degrees later [12]. To address eq-

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Manuscript received December 3, 2018

uity, students must be adequately exposed to and trained in computing and computational thinking. While this should ideally happen in required courses during the regular K-12 school day, the reality is that most children do not get access to the preparatory privilege of access to computing education [13]. Kimberly Bryant recognized this disparity, founding Black Girls Code to provide young and pre-teen girls of color opportunities to learn in-demand skills in technology and computer programming at a time when they are naturally thinking about what they want to be when they grow up [14].

Recent news has highlighted the differences between the composition of technology companies and the people who use their software - as in the Facebook has a black people problem memo by former Facebook employee Mark Luckie highlighting the lack of representation of black Facebook employees compared to Facebook users [15]. These inequities demonstrate why the conference for Research on Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT) is not only a timely, but also much-needed conference [16]. Many articles like these have highlighted the stark differences between the overall population and the kinds of people who get to do the creative work in the technology industry. However, making real change has proven difficult in both industry and academia [17]. Work in this space to broaden participation in computing is more than simply service, as some might argue. It is necessary research that unlocks how to better identify, include, retain, and prepare diverse people to become computing students, graduates, and professionals.

While we push for tech diversity in schools and industry, we must also ensure that we continue to push for it in the higher education community. We need not only the representation of faculty from diverse demographic groups, but we also need respect (pun intended) for diversity of ideas and research topics in computer science, including those focused on education, access, equity, and inclusion.

The RESPECT conference is our contribution to addressing this need. Since its inception in 2015, RESPECT has provided a peer-reviewed venue for presenting innovative research, experiences, and ideas on broadening participation of underrepresented groups in computing [16]. We value diversity, equity, and inclusion in computing. We comprise researchers and practitioners from diverse fields, studying and implementing projects in diverse environments, from K-12 and higher education to the workforce and society. We comprise and research diverse groups, including race, ethnicity, disability, gender, LGBTQ, rural/urban, and socioeconomic status. We don't just talk the talk, we walk the walk. The RESPECT committees are comprised of men and women from diverse races, ethnicities, genders, and institutions with one common goal: to change the narrative.

We hope you will join in our important efforts through attending our conference! The fourth annual RESPECT 2019 conference is co-located with SIGCSE 2019, the Technical Symposium on Computer Science Education, on Feb. 27, 2019 in Minneapolis, MN. The themes of equity and inclusion are, by design, pervasive throughout the RESPECT program. The RESPECT 2019 research track includes papers, posters, and lightning talk presentations that examine barriers to equity and inclusion that impact the representation

of women, people of color, and people with disabilities across the entire CS education and workforce pipeline; that propose and evaluate interventions to promote inclusive pedagogy in computer science classrooms, including through K-12 teacher preparation; and that describe approaches to making equity and inclusion a first principle for CS education strategies at the school and state levels. This year, we are excited to partner with the RPPforCS community (<https://www.csforall.org/rppforcs/>) and the ECEP alliance (<http://ecepalliance.org>) to host conference tracks on building effective research-practice partnerships and Broadening Participation in Rural Communities, respectively.

RESPECT 2019 (<http://respect2019.stcbp.org/>) is supported through technical co-sponsorship by the IEEE Special Technical Community on Broadening Participation (STCBP), NSF grant CNS-1840538, and the STARS Computing Corps alliance for broadening participation in computing. RESPECT conference proceedings of peer-reviewed articles are submitted for inclusion in the IEEE Xplore and ACM Digital libraries. Extended versions of RESPECT papers have been included in special issues of the IEEE Computing in Science and Engineering journal.

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